

CLAIMS

What is claimed is:

1. A method for making a dual damascene pattern in a single etch process comprising:
 - 5 providing a wafer having at least one insulative layer formed thereon;
 - depositing a first photoresist layer over the at least one insulative layer;
 - patterning a first image into the first photoresist layer;
 - curing the first patterned photoresist layer;
 - depositing a second photoresist layer over the first patterned
- 10 photoresist layer;
 - patterning a second image into the second photoresist layer; and
 - etching the at least one insulative layer through the first patterned photoresist layer and the second patterned photoresist layer simultaneously in the single etch process.
- 15 2. The method of claim 1, wherein curing the first patterned photoresist layer comprises irradiating the first patterned photoresist layer with ultraviolet light.
- 20 3. The method of claim 2, wherein the ultraviolet light irradiates the first patterned photoresist layer for a time and at an energy dose sufficient to make the first patterned photoresist chemically resistant to organic solvents and developers.
4. The method of claim 1, wherein etching the at least one insulative layer through the first patterned photoresist layer and the second patterned photoresist layer further comprises employing an etch chemistry that ablates a pre-determined amount of the first patterned photoresist layer during the etching process without substantially affecting the second patterned photoresist layer.
5. The method of claim 4, wherein the etch chemistry is highly selective

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Sub 917 to the first patterned photoresist layer and to the at least one insulative layer over the second patterned photoresist layer.

6. The method of claim 1, further comprising removing the first patterned photoresist layer and the second patterned photoresist layer.

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7. The method of claim 1, wherein the first patterned photoresist layer is a positive tone photoresist layer.

8. The method of claim 1, wherein the second patterned photoresist layer
10 is a negative tone photoresist layer.

9. A method for making a dual damascene pattern using a dual layer patterning scheme and a single etch process comprising:

15 providing a wafer having at least one insulative layer formed thereon;
depositing a first photoresist layer over the at least one insulative layer;
patterning a first image in the first photoresist layer;
irradiating the first patterned photoresist layer with ultraviolet light to stabilize the first patterned photoresist layer;

20 depositing a second photoresist layer on the first patterned photoresist layer;

patterning a second image in the second photoresist layer;
etching the at least one insulative layer through the first patterned photoresist layer and the second patterned photoresist layer simultaneously in the single etch process, wherein the first image and the second image are substantially formed in the at least one insulative layer; and

25 removing the first patterned and the second patterned photoresist layers.

10. The method of claim 9, wherein irradiating the first patterned

photoresist layer with ultraviolet light is for a time and at an energy dose sufficient to make the first patterned photoresist chemically resistant to organic solvents and developers.

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11. The method of claim 9, wherein etching the at least one insulative layer through the first patterned photoresist layer and the second patterned photoresist layer further comprises employing an etch chemistry that ablates a pre-determined amount of the first patterned photoresist layer during the etching process without substantially affecting the second patterned photoresist layer.

10 12. The method of claim 11, wherein the etch chemistry is highly selective to the first patterned photoresist layer and to the at least one insulative layer over the second patterned photoresist layer.

15 13. The method of claim 9, wherein the first patterned photoresist layer is a positive tone photoresist layer.

14. The method of claim 9, wherein the second patterned photoresist layer is a negative tone photoresist layer.

20 15. A method for making a dual damascene pattern using a dual layer patterning scheme comprising:

providing a wafer having at least one insulative layer formed thereon;
depositing a positive tone photoresist layer over the at least one insulative layer;

25 patterning a first image in the positive tone photoresist layer;
irradiating selected portions of the positive tone photoresist through a mask to effect an image-wise pattern transfer, wherein the irradiated portions of the positive tone photoresist layer are removed;

polymerizing the first patterned photoresist layer using ultraviolet light radiation;

depositing a negative tone photoresist layer over the patterned positive tone photoresist layer;

5 irradiating selected portions of the negative tone photoresist through a mask to effect an image-wise pattern transfer, wherein the non-irradiated portions of the negative tone photoresist layer are removed;

10 etching the at least one insulative layer through the patterned positive tone photoresist layer and the patterned negative photoresist layer simultaneously in a single etch process, wherein the first image and the second image are substantially formed in the at least one insulative layer; and

removing the patterned positive tone and the patterned negative tone photoresist layers.

15 16. The method of claim 15, wherein the polymerized portions of the positive tone photoresist layer are chemically resistant to standard developer solutions and organic solvents.

20 17. The method of claim 15, wherein etching the at least one insulative layer through the patterned negative tone photoresist layer and the second patterned photoresist layer further comprises employing an etch chemistry that ablates a pre-determined amount of the patterned positive tone photoresist layer during the etching process without substantially affecting the patterned negative tone photoresist layer.

25 *Sub 37* 18. The method of claim 17, wherein the etch chemistry is highly selective to the patterned negative tone photoresist layer and to the at least one insulative layer over the second patterned photoresist layer.